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PROJ # 997326

18 NOV 70

IPO/OSB/M-65/65
3 November 1965

MEMORANDUM FOR: Assistant for Photographic Analysis, NPIC

SUBJECT: Report on Trip to [redacted]

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1. On 19 October 1965, [redacted]

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[redacted] we were given a general plant tour through the R&D area and Lens design portions of the plant. Discussions concerning the viewer were held at the Government Systems Division [redacted]. [redacted] head of GSD [redacted] was our main contact; however, we also met [redacted] during the discussions.

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2. At the [redacted] plant, the following items were discussed and changes requested: **TO THE PRESENT [redacted] REAR PROJECTION VIEWER.**

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a) Masking of information contained in the margin of the film between the image area and film edge: The latest model [redacted] viewer has a six inch cut-away that allows this information to be projected on the screen. The hold-downs and the vacuum combs still mask about 1/16 inch of film. This was not considered detrimental.

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b) Disengaging of pushbuttons showing magnification settings: At present, when the instrument is turned off, the depressed magnification button becomes disengaged from the circuit and will not light up when the instrument is turned on. [redacted] stated that the magnification button will remain depressed while the instrument is off and will be illuminated when the instrument is turned on. This will immediately indicate what magnification is set when the instrument is turned on. This is a new modification.

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c) Cleaning of instrument is excessive: At present the bottom of the viewer is open and allows dust and small dirt particles to settle on the lenses, front surface mirrors and the screen. To prevent this occurring, a bottom cover plate was requested to function not only as a dust cover but also to prevent oil or other lubricant from dropping on the floor.

Declass Review by NGA.

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d) Correcting microswitches to prevent rotation of the stage through stops: There have been occasions where the platen has rotated through the microswitch stops and jammed. Covers will be provided on these switches to prevent tripping at inappropriate times allowing the excessive rotation. Circuitry will also be checked for possible malfunctioning.

e) Operating Azimuth Centering Button: If the instrument is turned off without centering the film carrier, the carrier can be rotated through the limit switches causing a jam as in item d. New circuitry will control this and also allow azimuth centering upon turning the instrument on - this now is not possible.

f) Rewinding film for correct orientation on screen: A clockwise and counterclockwise slew motor switch will be available on the new instruments. This will negate the requirement for respooling of film.

g) Operating stand-by switch on front control panel: The only way that film slew can be stopped, when the film is no longer in the platen, is to turn the instrument off or flip a switch at the loader's station in the rear. It was suggested that a stand-by switch be present on the operator's panel to control the film drive (slew) motors.

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h) Blowing of fuses: [] was not aware that the fuse blew when the screen illuminating light blew out. They had this problem with the earlier models but this has been corrected. On ours, (the AMS instrument), they stated that a resistor across the leads would prevent blowing fuses.

i) Changing film scan motor circuitry: The AC scan motor drive will be replaced with a DC circuit (printed-Circuit) design that will have an 800:1 speed range. The capstan roller drive will have worm gears to prevent film creep and allow a smoother scan of the film.

j) Scratching of film: The feeler arms that now control the torque on the film will no longer be needed when the DC printed circuit slew motors are used. These feelers had been scratching the film. Positive air pressure will be applied to underside of film to keep it from touching the platen thus reducing the possibility of scratching film.

k) Regulating film slew: A variable tension adjustment is available on latest models for allowing even film-slew speeds by adjusting potentiometers in the power packs. This adjustment is made by turning a dial to the indicated film width and film length.

l) Illuminating film loading station: New models have a light at the film loading station to allow illumination during loading of film.

m) Changing film slew drive: A printed circuit DC motor may be used instead of the present, larger AC motor. This will eliminate the need for bevel gears on the AC motor drive. Film spools will be belt driven. Variable tension is available through the DC drive, whereas in the AC drive the feelers regulated the applied film drive torque. There was some reservation expressed by [] concerning the tension applied to the film through the DC motors. [] stated that the instrument for [] would have this configuration and it will be thoroughly tested.

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n) Reducing vacuum pump noise: [] stated that it is possible to inclose the vacuum pump to reduce the noise level.

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o) Focusing time extremely long: The newer models of this instrument have a two speed focusing capability.

p) Preventing glare on screen from illuminated dials: The latest models have a deflector between the dials and the screen.

q) Rotating azimuth indicator and joystick: Although the instrument that we have been evaluating has this arrangement, the newer models have a stationary joystick and no azimuth orientation indicator. It was felt that this was convenient for resetting film in its correct orientation (North to South usually) as the PI checks the location of cultural features on a map. The film travels as the joystick is oriented in the older model. The latest has a toward and away-from-the-operator motion only on the joystick control for scan or slew.

r) Cycling of lens and condensors considered slow: The cycling time of the new models has been reduced from thirteen seconds to four seconds.

s) Viewing image on older instrument is highly directional: In the instrument on loan, the imagery can be viewed with good illumination immediately in front of the operator. Viewing at an angle of any other area results in a reduction of apparent illumination. As the operator moves to a new position perpendicular to the screen at the new point of interest, that area is well illuminated. This is due to the screen material used which is designated L S 75G. The new screens are Polacoat 60 giving almost as good resolution for the entire screen as is available with the present L S 75G screen.

DOESNT
UNDERSTAND
THE PROBLEM

BY THE NARROW BRIGHTNESS DISTRIBUTION LORE. THIS IS ACTUALLY CAUSED

t) Photographing image viewed on screen: [] now has a capability for mounting an 1824 printer/processor on the top of their viewers. The print is produced by a wet process (developer & fix). After exposure and processing, the print is slightly damp and fairly stable for about three months at normal temperatures and if kept out of the light when not in use. Permanent prints can be made by additional washing and fixing by the photo lab. Resolution is approximately six lines/millimeter/magnification; however, this is dependent upon the magnification and type of paper used. An average of 80-100 l/mm should be possible in most cases. Waste of paper is one drawback in that the entire 18 inch width will be used, the length of the exposed portion can be regulated by masking and hand advance of the exposed paper. To all intents and purposes however, it will be easier to use the entire 18 X 24 inch format of the printer during each

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exposure. One other shortcoming of this printer is the production of a negative and not a positive. No reversal processing is at present available, [redacted] stated that he would investigate the possibility of reversal processing.

v) Conserving space by reducing access door size: It was requested that the large access doors be hinged to reduce the amount of space required for access into the loading station and electronics section on both sides of the viewer. [redacted] said that this could be done and that they would study it.

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w) Other minor items of discussion were placing convenience outlets on both sides under the operator's control panel and painting the control panel dark blue to reduce reflections.

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3. It was requested that an informal proposal be sent to [redacted] for forwarding to NPIC. This quotation was received and is based on a ten instrument requirement.

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a) Delivery of the first three or four instruments in 120 days. The balance will be delivered within 180 days.

b) Cost figures are as follows:

1 instrument
5 instruments
10 instruments

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4. [redacted] was informed that the cost and delivery figures were to be forwarded to NPIC for estimation only and that formal request would be made for these data when and if NPIC desired the purchase of the rear projection instruments.

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[redacted]
Chief, Logistics Support Section, PAG

Attachment: AM-P 18:24 Printer Brochure

DISTRIBUTION:

Orig & 1 - Addressee
2 - P&DS [redacted]
3 - GMD
4 - STD
5 - OSB (Chrono)

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ITEMS

CONFIGURATION (1-5)	4	5	5	0	4	1
RESOLUTION (1-10)	3	5	3		3	5
DISTORTION (1-7)	3	3	3		3	4
NUMBER OF OBJECTIVES (OVERLAP) (1-5)	0	0	3		3	0
AMOUNT OF COLOR	0	4	3		5	2
SCREEN (1-6)	4	2	2		2	0
BRIGHTNESS (1-12)	8	4	8		8	10
COOLING (1-8)	5	5	0		5	1
FOCUS COMPENSATION (1-8)	0	0	5		4	8
IMAGE ROTATION (1-6)	6	3	1		1	2
FILM TRANSPORT (1-7)	1	3	3		7	3
LOADING EASE (1-7)	3	7	5		1	6
Critical SYSTEM (1-5)	3	3	5		5	0
PILOT SPEED (1-5)	4	4	5		5	3
	44	48	51		56	45

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(5) (3) (2) (1) (4)
 (4) (2) (5) (1) (3)

EVALUATION OF [REDACTED] PROPOSAL
FOR AN ADVANCED REAR
PROJECTION VIEWER

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SUMMARY

1. DESIGN OF HINGED SCREEN AND FILM LOADING
ACCESS IS UNDESIRABLE:

~~a.~~

a. REGULAR OPENING AND CLOSING OF SCREEN
IS CONDUCIVE TO ITS MISALIGNMENT WITH
RESPECT TO THE PROJECTION PATH,

b. THE DELICATE DIFFUSING SURFACE ON
THE INSIDE OF THE SCREEN IS EXPOSED
TO DAMAGE DURING EACH FILM
LOADING OPERATION.

2. SIMILARLY, THE "SWING-UP" MIRROR ABOVE
THE FILM GATE IS ANOTHER POTENTIAL
WEAK SPOT AT WHICH THE OPTICAL PATH MAY
BECOME MISALIGNED WITH WEAR FROM THE
REGULAR FILM LOADING OPERATION.

3. AT THE SPECIFIED 53.5" THE SCREEN CENTER IS 4-5" ABOVE THE D.O. REQUIREMENT AT THE EYE LEVEL OF A SEATED 5'10" OPERATOR
4. FOR THE BEST COMPROMISE THE SCREEN SHOULD BE PERPENDICULAR TO THE FLOOR. WHILE THE "FORWARD TIP" OF THE SCREEN DESIGN MAY BE DESIRABLE IN THE UPPER HALF OF THE SCREEN, IT (THE "TIP") IS DIRECTLY OPPOSITE TO GOOD HUMAN ENGINEERING FOR DISPLAYS BELOW THE OPERATORS EYE LEVEL (THIS IS LIKELY TO BE THE SCREEN AREA MOST FREQUENTLY VIEWED BY THE OPERATOR).

~~25X1~~ 5. ~~[REDACTED]~~ TAKES EXCEPTION TO THE D.O. REQUIREMENT FOR RESOLUTION OF "10 L/MM/POWER ANYWHERE ON THE SCREEN." WHILE THIS REQUIREMENT SEEMS TOO DEMANDING, ESPECIALLY FOR A ZOOM SYSTEM, I DO NOT BELIEVE ~~[REDACTED]~~ HAS GIVEN A COMPLETE DESCRIPTION OF WHAT THEY WILL ACHIEVE. THEY CLAIM 10 L/MM AT 3X, 6 L/MM AT 70X

(FOR A MAXIMUM OF 420 L/MM). IS THIS
 ON-AXIS RESOLUTION AT THE SCREEN CENTER?
 HOW MUCH FALL-OFF WILL OCCUR OUT
 TO THE CORNERS? IS THE PROGRESSION
 FROM 10 L/MM TO 6 L/MM LINEAR OR
 WILL IT DROP SHARPLY AND QUICKLY FROM
 THE 10 L/MM TO NEAR THE 6 L/MM?

THIS DESIGN IS QUITE SIMILAR TO
 ONE THEY PROPOSED TO BUREAU TWO
 YEARS AGO. AT THAT TIME THEY
 WOULD NOT RESPOND OFFICIALLY TO A
 DO. REQUIREMENT OF ONLY 8 L/MM
 ON-AXIS (WITH LESS IN THE CORNERS), ONLY
 PROMISING TO EXCEED PAST PERFORMANCES
 (PRESUMED TO MEAN THE SCV).

- 25X¹ 6. THE [REDACTED] DESIGN FOR AUTOMATIC
 FOCUS DOES NOT MAKE CLEAR A FOCUS
 ACCOMODATION FOR EMULSION "UP" OR "DOWN"
 FILM LOADING. IN FACT IT SEEMS TO
 INDICATE THAT A MANUAL OVERRIDE WILL
 BE NECESSARY FOR A SUBSTANTIAL PART
 OF THE OPERATION.

4.

7. HOW VALID IS THE CLAIM^{25X1}
THAT "SEVERAL PER CENT" IMAGE DISTORTION
ACROSS THE SCREEN IS "NO SERIOUS DIS-
ADVANTAGE"? THEIR REASONING SEEMS
RIGHT, BUT IT IS A DEPARTURE FROM
THE DEVELOPMENT OBJECTIVE.

25X1 8. ALSO EXCEED THE MAXIMUM 10%
BRIGHTNESS REQUIREMENT FALL OFF ON THE SCREEN.
WHILE THIS, TOO, MIGHT BE ACCEPTABLE,
THEY DO NOT PROVIDE AN ALTERNATIVE
MINIMUM UPON WHICH ACCEPTANCE AND
CONTRACT CONFORMANCE COULD BE BASED.

9. THEY INDICATE THAT THE XENON ARC
LAMP WILL BE ENCLOSED IN A METAL BOX
FOR SAFETY. IS THIS SUFFICIENT PRE-
CAUTION - ESPECIALLY WITH THE LAMP'S
POSITION CLOSE TO THE OPERATOR. IN
THE PAST THESE LAMPS HAVE EXPLODED
IN VIEWERS. WHILE THERE IS INFORMATION
THAT THIS PROBLEM HAS BEEN OVERCOME,
 SIMPLY DOES NOT DISCUSS
IT SUFFICIENTLY.

10. SIMILARLY, THEY DO NOT CONVINCE ME THAT THE COLD MIRROR (WITH HEAT SINK) AND A BLOWER SYSTEM WILL BE ADEQUATE TO CONTROL HEAT, THEY DO CONFIRM THE D.O. REQUIREMENT AND CAN BE HELD TO THIS CONTRACTURALLY.
11. I WOULD LIKE TO HEAR AN EDLB CONFIRMATION OF THEIR DESIGNS FOR:
- a. MOSAIC LENS CONDENSER AND
b. OZONE ELIMINATION.
12. IF A REVISED WORK STATEMENT FOR THIS CONTRACT IS CONSIDERED, I WOULD LIKE TO SUGGEST THE FOLLOWING DESIRABLE FEATURES:

a. A "NO-HANDS" REFINEMENT OF THE JOYSTICK TO PERMIT COMFORTABLE SCANNING OF FILM WITHOUT MAINTAINING PRESSURE ON THE CONTROL

b. SUPPLEMENTARY FOOT PEDAL
CONTROLS FOR ONE OR MORE
FUNCTIONS

c. BUTTON CONTROLS TO "ZERO
POSITION" IMAGE ROTATION AND
POSITION THE MID POINT OF THE FILM
GATE AT THE CENTER OF THE
SCREEN.

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NOTE: BY THE WAY, THE [REDACTED]
~~DESIGN DOES NOT INDICATE WHETHER~~
~~OR NOT THE MID POINT OF ALL~~
~~THE VARIOUS WIDTHS OF ROLL~~
~~FILM WILL ALWAYS FALL AT THE~~
~~MID POINT OF THE GATE (IN OTHER~~
~~WORDS, BOTH SUPPORT/DRIVE SPINDLES~~
~~FOR EACH SPOOL OF FILM WILL MOVE~~
~~TOWARD EACH OTHER TO ACCOMMODATE~~
~~NARROWER FILM ROLLS). I BELIEVE~~
~~SUCH A DESIGN IS DESIRABLE -~~
~~IT IS PROVIDED ON MOST OF THE~~
~~LATEST REAR PROJECTION VIEWERS.~~

d. FILM CLEANING AND ANTI-
STATIC DEVICES.

13.. FURTHER, CARE MUST BE TAKEN
THAT THE JOYSTICK HAS A NULL
POSITION WHICH IS POSITIVE AND LIMITED
IN RANGE.
25X1  JOYSTICK ON
THE P/C-2 HAS BEEN CRITICISED AS
LACKING IN SENSITIVITY. IT MAY SIMPLY
HAVE AN EXCESSIVELY HIGH MINIMUM DRIVE
SPEED OR IT MAY "JUMP AWAY" TOO FAST
BEFORE SETTLING DOWN TO A MINIMUM
SPEED.

SCREEN

U/P -

- "No-hands" joystick scan
- Automatic image rotation
and Y-traverse centering buttons.
- Film cleaning + anti static
devices ?
- Interior controls necessary while
loading. OK
- What about varying feed speed
rotation reversed to accommodate
emulsion up or down? OK
- Ensure that image does not
go out of focus during scan,
including high magnification
X-axis (along the film) scan. Spec
- Assume joystick null position is
positive, and limited in range.
Joystick should not
rotate more than 90° X
- Joystick must rotate with
image rotation.

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- How about supplementing
✓ foot pedal controls?

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COMMENTS

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PROPOSAL FOR AN "ADVANCED REAR PROJECTION VIEWER"; EVALUATION OF

NOTeworthy D.O. REQUIREMENTS:

1. Resolve 10 dy/mm/powet any pt. on screen (!)
2. Screen shall be specified.
3. Minimum luminance 20 ft-l. @ 1.5 ND film.
No deviation by more than 10%.
4. Max film temperature = 100°F. (1.5 ND film)
5. D.O. does not specify that 9.5" film edges be visible on screen. (Or ^{does} $9\frac{1}{2}'' \times 9\frac{1}{2}''$ aperture imply?)
6. Ease of film loading of extreme importance.
7. Film footage counter provided.
8. Why 1000-ft. spools?

COMMENTS RE PROPOSAL (while reading; summarized elsewhere with req'd changes)

1. Selection of 5-element zoom to be expected following:

a) Failure of Comparison Viewer 25X1
utilizing "autofocus" design

b) Development of breadboard 25X1
zoom lens, 1963-64. (10:1 range)

NOTE: At that time, they did not

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~~URG~~

officially respond to 8 l/mm/paper, do requirement - an officially thought it might be "7-8 l- on axis, 4 l- in corners.

2. Five-element (2 fixed negative) zoom design of this proposal appears identical to that of prior proposal to BUWEPS.
3. They make much of "rigid primary frame"; however, screen (which is part of optical system) is in/on the front access door which will be opened for each film roll loading operation. How long will this screen stay in proper alignment with the projection optical path? Diffusing surface may be damaged by operator.
- 4 Is the xenon arc lamp safe? Especially in designed position at operators knees?
5. I like the inflatable pneumatic isolator/jack legs.

6. Separate "electrical + cooling module" is good idea.

7. "Resolution: 10 l/mm at 3x = 30 l/mm?"

6 l/mm at 70x" = 420 l/mm?

Less than 10 l - does not meet spec.
What about in between the extremes of magn?

8. Does "manual override" of automatic focus
to accomodate emulsion up or down
mean that operator must make
frequent focus corrections if film
is loaded "down" vs. "up", for
example? Bad, if it does.

9. Illumination fall-off exceeds 10% at
3x - 3.7x magnification (how much?).

Minimum

10. Film drive compares favorably with that
of requirement for NTSC's Sliding Screen
Tracing Viewer (proven out by evaluation of prototype SSTV):

0.002"/sec [ARPV] vs. 0.020"/sec [SSTV]

(¹¹
_{70x})

(¹¹
_{25x})

11. The DO specified that the center of the screen be located at the eye-height of a seated 5'10" operator - this is approximately 47.5" \pm 1". Therefore, the proposed screen center height of 53.5" is 4"-5" too high.

12. NOTE: Power & Cooling Module dimensions conflict on pages 3-4 and 3-7:

	3-4	3-7
Height	42" + casters	36"
Width	44"	44" (No conflict)
Depth	17"	24"

13. "Swing-up" mirror above film gate is another potential weak spot at which the optical path may become misaligned. (page 3-11) with wear, etc.

25X¹14. Historically, [] has designed transport systems which have ranged from somewhat awkward to load (SCV - but stereo, CCR, etc. were limiting factors) ~~and~~ to excellent (P/C-2).

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15. [redacted] takes tentative exception to max
brightnes fall-off of 10% and will only
specify it as a design goal.

16. Need qualifying statement from theoretical
optical expert re the "mosaic lens"
design of the condenser. (page 4-7).

17. Need theoretical "back up" re design to
eliminate ozone formation (page 4-8).

18. Heat absorbing filters are specified in text
but do not appear in diagrams.

19. Is 420 l/m² possible on LS-606 Polacast?
What about other NPIC screen developments?
(See #15 above)

20. Page 4-21: Is automatic control of film
drive necessary to prevent scratching as
the platens come closer together? Is this
included in [redacted] design.

YES

21. The D.O. calls for 1% of one percent maximum distortion of the image. [] proposes to change this to 2%, claiming they cannot

* provide 1/2% and high resolution concurrently and claiming that "several percent" distortion can be tolerated. How VALID?

22. The screen is tipped forward from the top some 10° (I guess). Generally speaking, this is not compatible with accepted human engineering design for that portion of the screen below eye level (the lower half of the screen in this case). This forward tilt is probably desirable for the upper half of the screen, however.

23. Are the cooling provisions adequate?

Considering the elaborate precautions [] took with their large measuring Variable Width Film Viewer to eliminate heat, will this 2500w. Xenon arc be controlled by the cold mirror with heat sink and the simple blower system described?